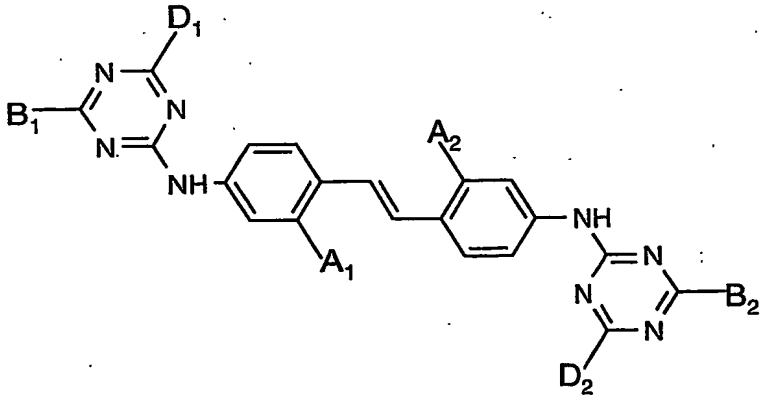
Claims

1. A compound of the formula



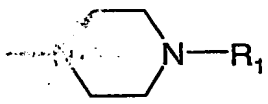
(1),

wherein

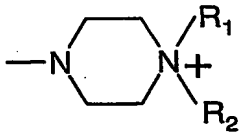
A_1 and A_2 each, independently of one another, represent $-SO_3^-$ or $-SO_3M$, where

M represents hydrogen, an alkaline or alkaline earth metal, ammonium or alkylammonium,

B_1 and B_2, independently of one another, represent the moiety



(2) or



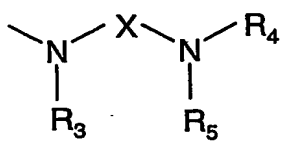
(3),

in which

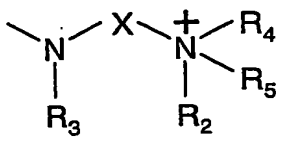
R_1 represents hydrogen, a straight-chain C_1-C_{12}alkyl or branched C_3-C_{12}alkyl group which C_2-C_{12}alkyl and C_3-C_{12}alkyl group, respectively, may be interrupted by one or two heteroatoms and is unsubstituted or substituted by one or two -OH, -OC_1-C_4alkyl, $-NH_2$, -NHC_1-C_4alkyl, -N(C_1-C_4alkyl)$_2$, -N-pyrrolidino, -N-piperidino, -N-morpholino or $-N^+$(C_1-C_4alkyl)$_3$ groups and

R_2 represents C_1-C_4alkyl, C_2-C_4hydroxyalkyl, $-CH_2CONH_2$, $-CH_2COOH$ or $-CH_2COO$ C_1-C_4alkyl or, alternatively,

B_1 and B_2 each, independently of one another, represent a group of the formula



(4) or



(5),

in which

R_3, R_4 and R_5 each, independently of each other, represent hydrogen, C_1-C_4alkyl,

C_2-C_4hydroxyalkyl, the group -X'-NR_6R_7 or the group -X'-$N^+R_3R_6R_7$, whereby at least one of the substituents R_4 and/or R_5 represents -X'-NR_6R_7 or -X'-$N^+R_3R_6R_7$,
X and X' each, independently of each other, represent a straight-chain C_2-C_8alkylene or branched C_3-C_8alkylene chain, which is unsubstituted or substituted by one or two -OH or -C(=O)- groups,
R_6 and R_7 each, independently of each other, represent hydrogen, C_1-C_4alkyl or, together with the nitrogen atom to which they are bound, complete a pyrrolidino, piperidino or morpholino ring and
R_2 is as previously defined and each
D_1 and D_2, independently of one another, are either defined as for B_1 and B_2 or represent halogen, -NH_2, C_1-C_4monoalkyl- or dialkylamino, said alkyl groups being unsubstituted or substituted by C_1-C_4alkoxy, amino, mono- or di-C_1-C_4alkylamino or tri-C_1-C_4alkylammonium; C_2-C_4hydroxyalkylamino, C_2-C_4di(hydroxyalkyl)amino, anilino, an aniline monosulphonic acid or sulphonamide residue or a 5- or 6-membered, saturated heterocyclic ring or, alternatively, mixtures of compounds of formula (1).

2. A compound of formula (1), according to claim 1, in which the residues A_1 and A_2 are identical, B_1 and B_2 are identical and D_1 and D_2 are identical.

3. A three-component mixture of compounds of formula (1), according to claim 1, comprising two components, as defined in claim 2, and a third component in which the residues A_1 and A_2 are identical, but either, B_1 and B_2 are different or D_1 and D_2 are different.

4. A compound of formula (1), according to claims 1 or 2, in which the moieties
B_1 and/or B_2 are represented by the formulae (2) and/or (3) and in which
R_1 represents hydrogen, a straight-chain C_1-C_4alkyl or branched C_3-C_4alkyl group which may be interrupted by one or two heteroatoms and is unsubstituted or substituted by one or two -OH, -OC_1-C_4alkyl, -NH_2, -NHC_1-C_4alkyl, -N(C_1-C_4alkyl)$_2$, -N-pyrrolidino, -N-piperidino, -N-morpholino or -N^+(C_1-C_4alkyl)$_3$ groups,
A_1 and A_2 are both -SO_3^- or -SO_3M,
M, R_2, D_1 and D_2 being as defined according to claim 1.

5. A compound of formula (1), according to claim 4, in which the moieties
B_1 and B_2 are identical and represented by the formulae (2) or (3), whereby

R_1 represents hydrogen, a straight-chain C_1-C_4alkyl or branched C_3-C_4alkyl group which may be unsubstituted or substituted by one or two -OH, -OC_1-C_4alkyl, -NH_2, -NHC_1-C_4alkyl, -N(C_1-C_4alkyl)$_2$, -N-pyrrolidino, -N-piperidino, -N-morpholino or -N^+(C_1-C_4alkyl)$_3$ group,
R_2 represents C_1-C_4alkyl,
A_1 and A_2 are both -SO_3^- or -SO_3M, whereby
M represents hydrogen, potassium or sodium and
D_1 and D_2 are identical and may be represented by halogen, especially chlorine, -NH_2, C_1-C_4monoalkyl- or dialkylamino, said alkyl groups being unsubstituted or substituted by mono- or di-C_1-C_4alkylamino or tri-C_1-C_4alkylammonium; C_2-C_4hydroxyalkylamino, C_2-C_4-di(hydroxyalkyl)amino, anilino, an aniline sulphonamide or sulphonic acid residue or a morpholino-, piperidino- or -N-C_1-C_4substituted piperazino ring.

6. A compound of formula (1), according to claims 1 or 2, in which the moieties
B_1 and/or B_2 are represented by the formulae (4) and/or (5), whereby
R_4 represents the group -X'-NR_6R_7 or the group -X'-$N^+R_3R_6R_7$,
X and X' each, independently of each other, represent a straight-chain C_2-C_8alkylene or branched C_3-C_8alkylene chain, which is unsubstituted or substituted by one or two -OH or -C(=O)- groups,
R_3 and R_5 each, independently of each other, represent hydrogen, C_1-C_4alkyl or C_2-C_4hydroxyalkyl,
R_6 and R_7 each, independently of each other, represent hydrogen, C_1-C_4alkyl or, together with the nitrogen atom to which they are bound, complete a pyrrolidino, piperidino or morpholino ring,
A_1 and A_2 are both -SO_3^- or -SO_3M,
M, R_2, D_1 and D_2 being as defined according to claim 1.

7. A compound of formula (1), according to claim 6, in which the moieties
B_1 and B_2 are identical and represented by the formulae (4) or (5) whereby
R_4 represents the group -X'-NR_6R_7 or the group -X'-$N^+R_3R_6R_7$,
X and X' each, independently of each other, represent a C_2-C_4alkylene chain, which is unsubstituted or substituted by -OH,
R_3 and R_5 each, independently of each other, represent hydrogen or C_1-C_4alkyl,

R_6 and R_7 each, independently of each other, represent hydrogen, C_1-C_4alkyl or, together with the nitrogen atom to which they are bound, complete a pyrrolidino, piperidino or morpholino ring,

R_2 represents C_1-C_4alkyl,

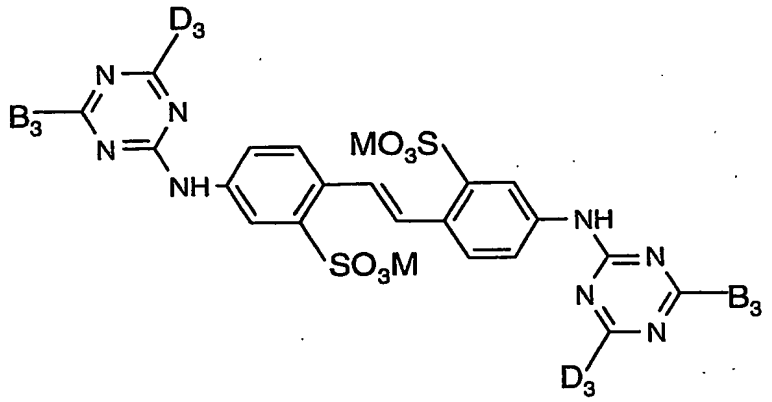
A_1 and A_2 are both $-SO_3^-$ or $-SO_3M$, whereby

M represents hydrogen, potassium or sodium and

D_1 and D_2 are identical and may be represented by halogen, especially chlorine, C_1-C_4monoalkyl- or dialkylamino, said alkyl groups being unsubstituted or substituted by mono- or di-C_1-C_4alkylamino or tri-C_1-C_4alkylammonium; C_2-C_4hydroxyalkylamino, C_2-C_4-di(hydroxyalkyl)amino, anilino, an aniline sulphonamide residue or a morpholino-, piperidino- or -N-C_1-C_4alkylsubstituted piperazino ring, an anilino residue being preferred.

8. A process for the preparation of a compound of formula (1), or for mixtures of compounds, as defined in claim 3, by reacting, under known reaction conditions, cyanuric chloride, successively, in any desired sequence, with each of 4,4'-diaminostilbene-2,2'-disulphonic acid, an amino compound capable of introducing groups B_1 and/or B_2 or precursors or mixtures thereof and an amino compound capable of introducing groups D_1 and/or D_2 or precursors or mixtures thereof, B_1, B_2, D_1 and D_2 being as defined in claim 1.

9. A compound of the formula



(6),

wherein

B_3 represents a group of the formula $-NH(CH_2)_nNR_8R_9$, n being 2, 3 or 4 and

D_3 represents halogen, an anilino, anilino-sulphonic acid or anilino-sulphonamide residue,

R_8 and R_9 each. Independently of each other, represent hydrogen, C_1-C_4alkyl, C_2-C_4-hydroxyalkyl or, together with the nitrogen atom to which they are bound, complete a pyrrolidino, piperidino or morpholino ring and M, is as defined in claim 1, with the proviso that

those compounds in which D_3 is anilino, B_3 is an N-(3-aminopropyl)-diethanolamino, N,N-dimethyl-1,3-propanediamino or 4-(3'-aminopropyl)morpholine residue or in which D_3 represents a sulphanilamide residue and B_3 is a 4-(3'-aminopropyl)morpholine residue and M is hydrogen are excluded.

10. A process for the preparation of a compound of formula (6) by reacting, under known reaction conditions, cyanuric chloride, successively, in any desired sequence, with each of 4,4'-diaminostilbene-2,2'-disulphonic acid, an amino compound capable of introducing groups B_3 and an amino compound capable of introducing groups D_3, B_3 and D_3 being as defined in claim 9.

11. Use of the compounds of formula (1) or mixtures thereof, as optical brightening agents for synthetic or natural organic materials.

12. Use of the compounds of formula (1) according to claim 10 as optical brightening agents for paper in pulp, size-press, metering press or coating applications.

13. Use of [illegible] mixtures, as defined in claim 3, as optical brightening agents for paper in pulp, size-press, metering press or coating applications.